CLAIMS

What is claimed is:

1. A method for generating a population of nanoparticles having a narrow size distribution comprising:

   a) providing a population of stabilized, charged, water-soluble, nanoparticles having a broad size distribution;

   b) dissolving the stabilized, charged, water-soluble, nanoparticles in an aqueous solution containing an electrolyte;

   c) adding a substantially water-miscible organic solvent to the dissolved nanoparticles of (b) whereby a certain size fraction of the nanoparticles are precipitated; and

   d) collecting the nanoparticle precipitate of step (c) having a narrow size distribution.

2. A method according to Claim 1 wherein steps (c) and (d) are optionally repeated at least once to increase the substantially water-miscible organic solvent content of nanoparticle solution and to collect nanoparticle fractions having different narrow size distributions.

3. A method according to Claim 1 wherein the nanoparticles are coated with a monolayer.

4. A method according to Claim 3 wherein the monolayer coating is selected from the group consisting of tiopronin, glutathione, coenzyme A, poly(ethylene glycol), poly(ethylene oxide), and poly(vinyl alcohol).

5. A method according to Claim 1 wherein the nanoparticles are metal nanoparticles

6. A method according to Claim 5 wherein the metal nanoparticles are comprised of metals selected from the group consisting of gold, silver, platinum, palladium, and copper nanoparticles, and alloys thereof.

7. A method according to Claim 6 wherein the nanoparticles are comprised of gold.

8. A method according to Claim 1 wherein the nanoparticles are semiconductor nanoparticles

9. A method according to Claim 8 wherein the semiconductor nanoparticles are comprised of materials selected from the group consisting of cadmium selenide, cadmium sulfide, silver sulfide, cadmium sulfide, zinc sulfide, zinc selenide, lead sulfide, gallium arsenide, silicon, tin oxide, iron oxide and indium phosphide.

10. A method according to Claim 1 wherein the nanoparticles are about 100 nm or less in diameter

11. A method according to Claim 1 wherein the nanoparticles are about 40 nm or less in diameter.

12. A method according to Claim 1 wherein the electrolyte is selected from the group consisting of sodium chloride, sodium phosphate, sodium citrate, sodium acetate, magnesium sulfate, calcium chloride, ammonium chloride, and ammonium sulfate.

13. A method according to Claim 12 wherein the electrolyte is sodium chloride.

14. A method according to Claim 1 wherein the substantially water-miscible organic solvent is selected from the group consisting of methanol, ethanol, isopropanol, dimethyl sulfoxide, tetrahydrofuran, dimethylformamide, dioxane and acetone.

15. A method according to Claim 14 wherein the substantially water-miscible organic solvent is methanol or ethanol.

16. A method according to Claim 1 wherein the substantially water-miscible organic solvent is a mixture of organic solvents.

17. A method according to Claim 16 wherein the mixture of organic solvents are combinations selected from the group consisting of ethyl acetate and methanol; ethyl acetate and ethanol; ethyl acetate and isopropanol; ethyl acetate and acetone; ethyl acetate, dimethylformamide, and dimethyl sulfoxide; and ethyl acetate, tetrahydrofuran, and dioxane.

18. A method according to Claim 1 wherein the nanoparticles are collected by centrifugation or filtration.

19. A method for determining the average size of stabilized, charged, water-soluble nanoparticles comprising:

a) providing a population of charged, water-soluble nanoparticles of unknown size in an aqueous solution in combination with a densifying agent;

b) providing a solution of stabilized, charged, water-soluble nanoparticle size standards of known size in combination with a densifying agent;

c) loading the nanoparticles of (a) and (b) on to an electrophoresis gel;

d) separating the loaded nanoparticles of (c) by applying an electric field to the gel; and

e) determining the average size of the unknown nanoparticles by comparing their mobility in the gel with the mobility of the nanoparticles size standards.

20. A method according to Claim 19 wherein the densifying agent is selected from the group consisting of glycerol, sucrose and Ficoll®.

21. A method according to Claim 19 wherein the gel is comprised of agarose or polyacrylamide.

22. A method according to Claim 19 wherein the gel is an agarose gel having an agarose concentration of about 0.6 % to about 7 %.

23. A method according to Claim 22 wherein the gel is a 4% agarose gel.

24. A method according to Claim 19 wherein the gel is a polyacrylamide gel having an acrylamide concentration of about 3.5% to about 21%.

25. A method according to Claim 19 wherein the nanoparticles are metal nanoparticles.

26. A method according to Claim 19 wherein the nanoparticles are about 100 nm or less in diameter.

27. A method for fractionating stabilized, charged, water-soluble nanoparticles of a specified size comprising:

(a) fractionating the stabilized, charged, water-soluble nanoparticles according to the method of Claim 1; and

(b) determining the average particle size of the fractions according to the method of Claim 19.

28. A method for fractionating stabilized, charged, water-soluble nanoparticles of a specified size comprising:

(a) fractionating the stabilized, charged water-soluble nanoparticles according to the method of Claim 1; and

(b) determining the average particle size of the fractions using transmission electron microscopy.

29. A population of nanoparticles fractionated by the method of Claim 1.

30. A population of nanoparticles having a narrow size distribution.